Form ESA-B4. Summary Report for ESA-045-3
Public Report - Final

Company	Pratt Paper	**ESA Dates**	3/12/2008 to 3/14/2008
Plant	Pratt Paper Staten Island, NY	**ESA Type**	Steam Assessment
Product	Recycled Paper	**ESA Specialist**	Michael B. Muller

Brief Narrative Summary Report for the Energy Savings Assessment:

Introduction:

Pratt Industries' Staten Island paper plant produces recycled paper from paper collected throughout the New York City area. The product is 100% recycled. The plant is also being expanded to include a corrugated paper production line.

Objective of ESA:

Evaluate the current steam and energy uses and trends to identify areas of potential reduction or more efficient steam and related energy use.

Focus of Assessment:

The major steam user is the paper machine, with the starch cooking and pulper using the remainder of the steam. As the plant is relatively new, the focus of the assessment was on optimizing the existing steam system efficiency and operation.

Approach for ESA:

The steam usage and paper production levels were compared to determine current benchmark energy requirements. Then a steam balance of the system was developed to identify various areas' steam usage levels and associated costs. Modifications to equipment and operational procedures were then evaluated to determine the cost/benefits to the overall steam system.

Pratt has another plant in Conyers, GA that has a very similar steam system. Steam system data from Conyers was also modeled for comparison to identify potential areas of investigation for energy savings. The only major difference between the two plants is that Staten Island requires 8 klb/hr of steam for the pulper. As the Conyers' plant is located in a warmer climate and has cleaner stock, this significantly reduces the pulper steam needs.

General Observations of Potential Opportunities:

- Plant operates with a nearly continuous and full production load with minimum downtime.
- Boiler operating near capacity, as designed, therefore, no opportunity for pressure or other operational adjustments.
- Plant continues to operate as initially designed with minimal modification to the process and equipment.

Near Term Opportunities

- Repair Steam and Condensate Leaks

Several major steam leaks and a condensate leak were observed in the plant. While the plant does conduct routine repairs, it appears that several leaks were reoccurring, or require additional repairs. This is most likely the result of the plant's priority of keeping everything up and running.

A rough but conservative estimate of steam leaks from steam traps, valves, and broken seals, would be 400 lb/hr. The plant steam currently costs about per klb, as calculated with SSAT. This results in an associated steam leak cost of about $38,000 a year. As these steam leaks will be fixed eventually, the only additional implementation costs would result from expedited maintenance costs, which would most likely be minimal. These costs could be further reduced with the implementation of a more proactive maintenance program.

- Develop and Implement a Economic and Preventative Maintenance Program

For maintenance to be prioritized, it needs to clearly be causing a problem that affects the operation of the steam system. Maintenance issues are currently resolved with a focus on assuring continued functioning of the steam system. Issues and problems affecting system efficiency and ultimately operational cost did not appear to be routinely considered when scheduling and determining the level of maintenance required.

Developing a maintenance plan that estimates the costs of the various issues, in addition to the effects on system operation, could potentially justify action on maintenance issues earlier and more efficiently than the current procedure. Additionally, tracking problem areas and maintenance trends, with a focus on determining the reasons for the root cause of the various problems, could be combined with the economical and operation analysis. The results could then be used to justify undertaking larger maintenance projects, with a goal of reducing routine maintenance, downtime or bottleneck of production.

> Ex. Determine that a pipe or valve failure results from water hammer caused by piping layout issues and modifying layout to reduce or eliminate the pipe or valve failure, as opposed to fixing the valves or pipes when they fail.

- Compare Best Practices with Sister Plant and Replicate Successes

The Conyers' plant steam system is nearly identical to the Staten Island plant. As both plants generally run similar grades of paper, routine comparisons of the steam systems could be extremely useful. First, a baseline of the differences would be required to improve the study. This would primarily include evaluating the difference in pulper steam usage, as well as, the different effects of paper quality and weight. Adjusting for these differences would potentially make it relatively easy to identify savings opportunities.

Opportunities could include upgrades or procedural differences that result in more efficient operation. This also increases the benefits of test projects at either plant, as they can be tested and easily replicated if found to be successful. While both plants are looking to switch to biofuel boilers, process similarities should continue to be a source of useful comparisons.

Medium Term Opportunities

- Convert Starch Cooker to Lower Pressure Steam

The starch system currently runs off of the highest pressure steam which is blended with feedwater before combining with starch. At the same time, the wet box uses the same mass flow of steam, but instead uses flash steam from the S1 condensate return tank. As the wet box can potentially be more effective with higher steam pressures and temperatures, switching the steam flows could reduce dryer steam needs or increase production rates. Additionally, this could reduce water hammer in the starch cooker system.

The potential for this could be tested by piping high pressure steam into the wet box, when process steam requirements for the production allow for the availably of this extra steam. Ideally, data from a previous, similar run, over the same length of time, should be compared to determine the potential improvements in production rate and/or reductions in steam usage. If the improvement was significant, the steam lines could be permanently switched.

- Run Starch Cooker Continuously

The starch cooker runs in a batch mode, operating 45-60 minutes on, 15-20 minutes off. This results in a boiler load swing of 8 klb/hr. When heavier paper is being produced, the starch tank fails to reach its ideal temperature set point. The startup also produces a significant water hammer in the pipes surrounding the starch tank. Currently, to avoid water hammer damage and keep the steam flowing, the steam trap bypass valve, before the tank, is left open, dumping a significant quantity of steam.

Running the starch cooker continuously could reduce, if not eliminate, the water hammer issue and allow for the valve to be closed and the temperature maintained. Given that the valve is fully open, it could easily be dumping steam at a rate of 100 lb/hr. This results in the loss of at least $9,500 of steam a year, if not more.

Another alternative that was suggested involved adding a steam line that would run from the starch tank to the heating jacket on the hot water tank. This could also reduce water hammer by keeping the steam flowing in the system.

- Improve Air Flow in Dryers

According to the results of moisture content tests on the dryer stack air, several sections tested above recommended levels, with 2 sections maxing out the moisture scale. While it is difficult to quantify the exact benefits of reduced stack moisture content though increased air flow, the surveys indicate that there is definitely an opportunity for improvement which could increase production rates and reduce steam usage. As the pulper is currently the pinch point of the production line, the benefit for increased production rates is limited at this time. However, upgrading and/or adding fans, totaling an additional 50 horsepower, could potentially result in a ½% reduction in steam usage. This would save about $90,000 a year in steam with an increase in electrical costs of around $32,000.

- Consider Modifying Dryer Stacks to Pump in Pulping Area

Currently the exhaust from the dryers is primarily pumped out of the building. Given that the pulping area requires significant heating for its stock and fans pull air from the dryer area into the pulper area, the possibility exists to pump some of the dryer exhaust directly in the pulping area. This would serve to preheat and prep the stock more efficiently, potentially resulting in reduced steam needs and increase pulping rates.

- Overhaul Boiler

The steam system and boilers at the Conyers' and Staten Island plants are nearly identical. The Conyers' plant recently repaired and overhauled components of their boiler, while similar components on the Staten Island boiler are having various maintenance issues. A comparison of the boiler efficiencies with the Staten Island plant indicates that there is a potential to improve the boiler efficiency by 2%. Assuming that the overhaul is responsible for most of this difference, and similar overhaul of the Staten Island boiler could save, as estimated by the SSAT model, $403,000 a year in reduced natural gas usage. The cost to overhaul of this type is likely around $500,000 to $750,000, but a better estimate could be obtained by reviewing the costs at the Conyers plant.

Long Term Opportunities

- Add Back-Pressure Steam Turbine to Biofuel Boiler

The plant is currently planning to install a biofuel boiler that will be designed to produce all of the steam needed for the site. Given the relatively cheap cost for the fuel, the plant is considering adding a back-pressure steam turbine to generate electricity from the system as well. Back-pressure turbines are common at many paper mills for this application.

As the biofuel boiler will, most likely, only provide saturated steam (no superheating) and be sized to the process steam requirements, a model was developed to evaluate the best implementation of a turbine, given these conditions.

For saturated steam, the maximum energy levels occur at around 440 psig. The outlet pressure can be assumed to be 150 psig, as most, if not all, steam users should be able to fully function on this header pressure. Finally using saturated vapor with a back-pressure turbine will drop the quality of the steam, requiring a small increase in steam production to make up for the condensate losses.

A suitable size for a turbine based on this model would be 4 MW with an isentropic efficiency of 70%. An additional 14 klb/hr of steam would also be required. Assuming a biofuel cost of $3 per MMBtu and a boiler efficiency of 70%, this turbine could produce electricity at around 1.5¢ a kWh. This would result in a $2.9 million savings a year in reduced electrical costs.

For a turbine of this size, equipment costs generally run in the $350 per kW range with installation cost adding $250 per kW. The total cost to install the turbine would potentially be $2.4 million with a payback of less than 1 year.

Natural Gas Savings

Near Term:	0.23%
Medium Term:	2.99%
Long Term:	0%
Total:	3.22%

Electricity Savings

Near Term:	0%
Medium Term:	-0.2%
Long Term:	22.7%
Total:	22.5%

Management Support and Comments:

DOE Contact at Plant/Company:

Michael Holmes
Pratt Industries
1800C Sarasota Parkway
Conyers, GA 30013
mholmes@prattindustries.com
678-607-1400